ROBERT ABBE: PIONEER IN NEUROSURGERY*

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ALTHOUGH this paper is intended to present an account of Dr. Robert Abbe as a pioneer in neurosurgery, it would not be correct to think of him as a neurosurgeon in the modern concept of specialization any more than to classify him as a plastic surgeon or radiotherapist. He was, in fact, primarily a general surgeon with interests extending into many fields of medicine and surgery. It would therefore seem permissible, in order to give a more accurate picture of his versatile nature, to include in this discussion something more about his contributions to general surgery in addition to those dealing directly with neurosurgical subjects. There are also some things about his work at St. Luke's Hospital and the Abbe museum at Bar Harbor which may be of interest.

Following his graduation from the College of Physicians and Surgeons in the class of 1874 and his internship at St. Luke's Hospital from 1874 to 1876, Dr. Abbe's surgical training was completed under the preceptorship of Dr. James L. Little. St. Luke's Hospital at that time was situated at Fifth Avenue and 54th Street on the site now occupied by the University Club. Dr. Abbe was appointed to the attending staff. He also became attending surgeon to the out-patient department of the New York Hospital, then located on 16th Street. He soon became recognized as one of the leading young surgeons in the city.

Among his medical friends were several who were interested in neurology, in particular Dr. Charles Dana, Dr. Edward Seguin and later Dr. Pearce Bailey. Dr. Dana became professor of neurology at Cornell and Dr. Seguin professor of nervous and mental diseases at the College of Physicians and Surgeons. Dr. Bailey was one of the founders of the Neurological Institute in New York and for a number of years was the neurological consultant at St. Luke's Hospital.

Stimulated by the enthusiasm of these men Dr. Abbe became interested in the surgery of the nervous system, notably of the spine

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and cord. This period of the early development of neurosurgery in New York was well described by Dr. Byron Stookey in his Elsberg Lecture in 1951.[1]

Dr. Abbe has been credited with the first removal of an extradural cord tumor in this country. There were two patients reported by him in which such an operation was done. It seems probable that in the first of these cases the mass which was thought to be an extradural tumor was in reality tuberculous but this is not certain. The operation was done on May 26, 1888 and the case was reported at a meeting of the New York State Medical Society early the next year.[2-4] The patient was a 22 year old man who was admitted to St. Luke's Hospital because of pain in his back of three months' duration. Gradually, while in the hospital, he developed a right paraspinal mass in the lower thoracic region, and a progressive loss of sensation and motor power in the legs with involuntary muscular twitching and incontinence of urine and feces. At operation the laminae of the eighth, ninth and tenth dorsal vertebrae were removed and a "mass of tissue and dessicated pus" which compressed the cord against the anterior wall of the spinal canal was removed. Eight days after operation, sensation began to return, his pain disappeared, and by the "fourth week he began to move his left leg and the toes of his right." He continued to improve over the ensuing months so that eight months later he walked "well and without support," was "stout and hearty and since operation absolutely without fever or evidence of tuberculosis. The tumor tissue was examined for bacilli but nothing but cellular tumor elements and pus found." Two years later this further comment was made about this patient:[5] "He resumed work and remained in perfect health for two years walking as well as ever and without fatigue. Recently, after confinement of the winter, he has had an abscess form in the cicatrix which had been so long healed and I have had to curette a sinus remaining from it." This had a "distinctly tubercular appearance."

Dr. Abbe[5] operated on another patient with an extradural cord tumor on April 16, 1890. This second patient had developed a complete paraplegia eight months previously. Although the diagnosis of cord compression had been accurately made by Dr. Seguin and operation advised, there had been considerable delay in getting around to it. The patient's condition was not good; he had been running a fever, and had albumin and casts in his urine. At operation the arches of the eighth,

ninth, and tenth dorsal vertebrae were removed and a "firm, dark growth was found to fill the vertebral canal, compressing the cord to the left side and flattening it somewhat forward." The entire tumor, together with an extension into the subpleural space, was bluntly dissected out. The patient seemed to do well for the first four days after operation but then developed hiccoughs and vomiting and died on his ninth postoperative day. Although a postmortem examination was not permitted except of the spinal wound, pathological examination of the tumor revealed a "round cell sarcoma."

About a year and a half later Dr. Abbe operated on a third patient who was thought to have a cord tumor. He was a 26 year old telegrapher who for five years had developed signs of a slowly progressive cord lesion in the midthoracic region. At operation, at the Post-Graduate Hospital in December 1891, instead of a cord tumor, the patient was found to have syringomyelia. The cord was greatly swollen over several segments by a cystic collection of clear fluid. "A drachm and a half" was aspirated through a hypodermic needle inserted through the posterior columns and the cord collapsed. There was no particular change in the patient's condition after operation. The case was presented before the Neurological Section of The New York Academy of Medicine by Dr. William B. Coley and Dr. Abbe on April 15, 1892.[6] This was the first recorded attempt at surgical treatment of a patient with syringomyelia.[7]

Although for many years he was not given credit for it, Dr. Abbe was the first surgeon to divide the posterior roots of the spinal nerves.[2-4, 8,9] The original idea was suggested, and the first suitable patient was referred to him, by Dr. Charles L. Dana. The patient was a 44 year old ice-man with severe pain involving the right arm and forearm. The pain had not been relieved by previous stretching of the posterior interosseous and ulnar nerves or by amputation of the arm. Because of the pain the patient was taking a half grain of morphine every hour.

At operation on December 31, 1888, under ether anesthesia, the right laminae of the lower four cervical vertebrae were removed and the dura exposed. No evidence of tumor or inflammation was found. The right sixth and seventh cervical nerves were exposed extradurally, were stimulated with an electric current and divided. The wound was packed open. The patient "bore the operation well but soon found

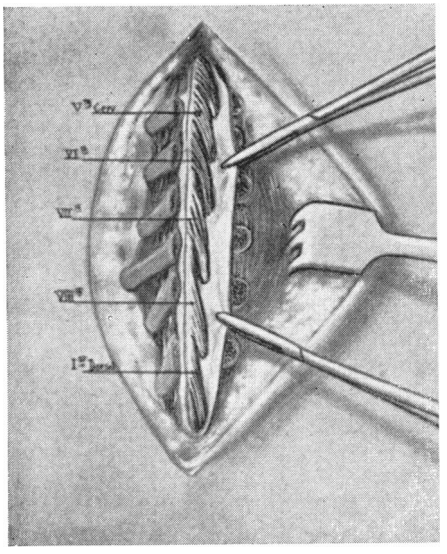

Fig. 1—An operative sketch of Dr. Abbe's showing the exposure for performing resection of the posterior roots of the brachial plexus. (St. Luke's Hospital Medical & Surgical Reports, 2:16, 1910. Reproduced by permission.)

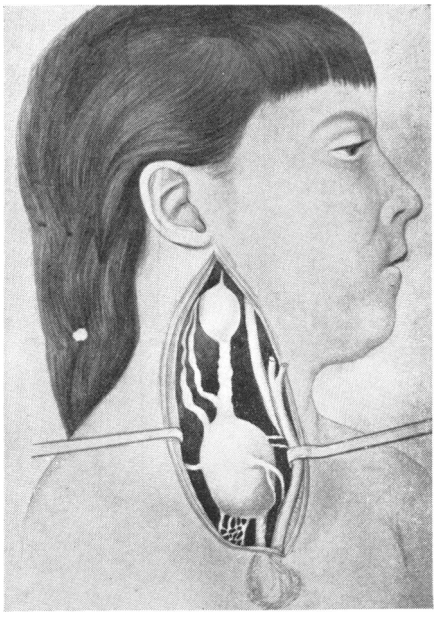

Fig. 2—Sketch by Dr. Abbe of patient with multiple neurofibromata of the cervical sympathetic nerves. (Ann. Surg. 27:488, 1898. Reproduced by permission.)

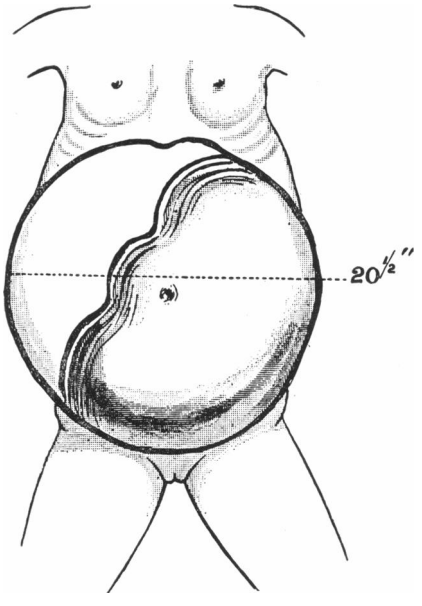

Fig. 3—Diagram of an infant with a large renal tumor removed by Dr. Abbe. (Ann. Surg. 31:273-385, 1899. Reproduced by permission.)

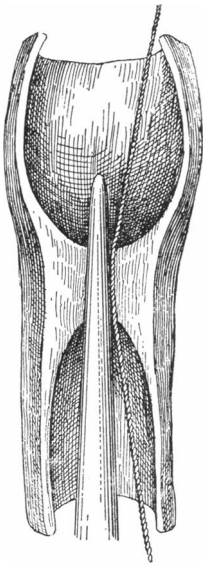

Fig. 4—Diagram of Dr. Abbe's string sawing method of dilating an esophageal stricture. (Medical Record, 43:225, Feb. 25, 1893: Medical Record, 72:890-892, 1907. Reproduced by permission.)

his old pain seemed much the same." Accordingly, forty-eight hours later, without anesthesia, the patient was placed prone "under a brilliant light," the packing removed "revealing a large clear dry wound at the bottom of which lay the dura throbbing and sound." The dura was slit open for one and a half inches "and was scarcely at all sensitive to cutting." The posterior root of the eighth cervical nerve was picked up intradurally and divided "close to the posterior columns of the cord" and a small piece was removed for "microscopical examination." "Handling this nerve root gave him the greatest pain." In addition the posterior root of the seventh cervical nerve, which had been previously divided extradurally, was also divided intradurally. The peripheral ends of the cut sixth, seventh, and eighth nerves were again stimulated with the electric current while careful observations of the responses were made by Dr. Dana. The dura "was sutured with fine catgut" and after injecting cocaine under the skin the entire wound was closed, leaving "a small linear scar." The patient "was allowed enough morphine to quiet the pain for eleven days," was then allowed to sit up and the drug was stopped entirely.

During the next few years Dr. Abbe and Dr. Dana were again able to repeat their observations and similar, but more extensive, posterior rhizotomies were performed on several more patients in one stage.[9] In 1911, in an article entitled "Resection of the posterior roots of the spinal nerves to relieve pain, pain reflex, athetosis and spastic paralysis—Dana's operation," Dr. Abbe[10] described the subsequent course of the first three patients who by then had been followed for 16 to 22 years and added two more cases not previously reported.

His interest in spinal surgery included other aspects also.[5, 11] He discussed the proper management of patients who became paraplegic following injury to the spine, particularly whether operation should be done or not, and recounted his own experience with decompressive laminectomy both good and bad.[12] He recommended the surgical repair of spina bifida with meningocele and condemned the earlier methods of injection.[13-15] He was interested in the treatment of Pott's disease of the spine and reported on his results with curetting out draining sinuses and infected bone.

During the latter part of the nineteenth century and the beginning of the twentieth a number of surgeons were seeking a satisfactory method for relieving the severe pain of trigeminal neuralgia. Early at-

tempts at section of the appropriate peripheral branches of the trigeminal nerve were found to be of only temporary benefit. Gradually operations were devised in which the larger branches were divided closer to the ganglion and eventually efforts were made to destroy or curette out the gasserian ganglion itself. Dr. Abbe's experience with the treatment of this condition was an extensive one and he presented a number of papers on the subject.[16-18] His early papers[19] reported his results with the best of the various peripheral nerve sections used up to that time. Although some patients appeared to have been cured by these methods there were recurrences and he was quick to adopt the newer operation devised by Dr. Frank Hartley of New York in 1891. In this the ganglion was exposed through a temporal intracranial extradural approach and the maxillary and mandibular nerves were divided intracranially at the foramina rotundum and ovale. Still concerned lest the nerves regenerate Dr. Abbe tried to prevent it by implanting a sheet of sterile gutta-percha rubber tissue over the foramina.[17, 20, 21] To test more fully whether such rubber tissue could be satisfactorily tolerated by the body he conducted a series of experiments on rabbits implanting the gutta-percha in various locations. He concluded that—"Its presence is borne well in any tissue. On the surface of the brain or between the dura and the skull, or outside the skull under the scalp, it maintains its full shape and remains unchanged. During five months before the rabbits were killed the rubber tissue laid on the surface of the brain without adhesions except at a portion of its margin."

In 1903 he reported the results of this work and the use of this method in eight patients followed for varying periods up to seven years.[17, 21] He believed that it was probably an effective aid in preventing regeneration of the nerves and safer than trying to remove or curette out the ganglion which almost always resulted in profuse hemorrhage and carried a relatively high mortality.

The idea of implanting rubber tissue was also used by Dr. Abbe in treating some patients with focal epilepsy due to cortical scars.[20, 22-25] After exposing the scarred area of the brain and dissecting the dura from it he placed the sheet of rubber over the brain and closed the dura over it. Some patients were improved after this was done but not always as he was to learn from Dr. McCosh[26] who, on re-exploring one of these cases, found the rubber all rolled up in a little ball embedded in the scar tissue. Dr. Abbe himself discovered much the same situation in some of

his patients whose tic douloureux recurred.[27]

From his service at the Roosevelt Hospital in 1897 he presented before the New York Surgical Society an interesting case of a nine year old girl with "large multiple neurofibromata of the cervical sympathetic."[28]

Two years later he related his experience, from this service, with the "Effects of intracerebral and subcutaneous administration of tetanic antitoxin in tetanus observed in nine cases."[29] Antitoxin was just beginning to be used and as with many new ideas Dr. Abbe was quick to learn about it, to study it and attempt to evaluate it. He concluded that the antitoxin was of distinct benefit and although the value of the intracerebral injection was not proven it was worthy of further trial in the most serious cases.

Throughout this same period when he wrote the papers already mentioned he was equally prolific on subjects of interest to the general surgeon. He wrote on intestinal obstruction,[30, 31] intestinal anastomosis and suturing,[32, 33] gallbladder disease,[34] and gallstone obstruction.[35] He discussed the problems of acute general peritonitis,[36, 37] peritonitis due to perforating typhoid ulcer[38-40] and peritonitis due to tuberculosis.[41-43] He made a special study of the cause of appendicitis,[44, 45] examining appendices removed during the "interval" between attacks.[46] On one occasion he presented three cases of large pancreatic cysts[47] which he had drained, and on another, two cases of intra-abdominal cysts arising from the kidney.[48]

The first major operations performed at the new Babies Hospital, then at Lexington Avenue and 55th Street, were done by Dr. Abbe.[49] There are two cases of particular interest on which Dr. Abbe operated. They were tremendous tumors of the kidney which filled the abdomen.[50, 51]

The first of these was a two year old girl with an abdominal mass increasing in size for five months. Operation had been refused at three of the largest hospitals in the city. Examination revealed the "abdomen to be distended by a solid growth occupying its greater portion, crowding upward and spreading the ribs, causing the lower abdomen to sag and fill the right loin." In the operation, which was performed on April 12, 1892, care was taken to wrap the patient warmly and she was positioned tilted at an angle of 45°. A transverse incision was used. There were numerous large veins over the surface of the tumor. "The growth

was shelled out of its bed and a good pedicle was formed which was tied with a silk ligature." There was little blood lost, "scarcely half an ounce." The operation lasted 45 minutes and "was well borne." The patient made a good recovery. The pathological report was round cell sarcoma but examination by Professor E. K. Dunham of Bellevue showed it to be "carcinoma sarcomatosum."

The second case was equally astonishing and was presented to the New York Surgical Society for examination. This patient was a girl one year and two months of age who was admitted to the Babies Hospital in 1892. The patient's mother had noted an enlargement of the abdomen for six weeks and examination revealed a solid tumor filling the abdomen. Operation was performed on November 20th, before a considerable audience. The same precautions were taken with this child to keep her warm and to place her in an inclined position. A transverse incision was again made. The mass was very large and covered with big veins. The greatest loss of blood occurred at the beginning of the operation on incising over the mass—about an ounce. After the incision the tumor was dissected out with the finger. A "narrow pedicle was at last made which was found to be double, one half holding the vascular supply of the tumor with its cellular bed and the other, when separated, holding the renal vessels and pelvis of the kidney. This was connected with a very pale kidney elongated to about five inches and throughout its entire length apparently normal in structure except that its upper end merged with the tumor with which it had been completely removed from its bed in the loin. Before ligating the double pedicle, critical examination showed that it was possible to amputate the kidney above its pelvis leaving one and a half inch of apparently sound structure attached to the tumor. This was done and a continuous suture of the kidney stump applied. The greater pedicle of the tumor alone was then ligated with silk and the kidney replaced in the loin. Not more than two ounces of blood were lost." The patient was kept inclined at 30° for two or three days after operation. Convalescence was smooth. The baby was fed on its mother's milk. The tumor weighed seven and one half pounds. The child, after operation, weighed only 15 pounds. The pathological report was rhabdomyosarcoma.

An excellent follow-up report on these patients was given in a paper presented before the 58th Annual Meeting of the Maine Medical Association at Bar Harbor in June 1910.[52]

The first case, the two year old girl, remained in perfect health until three and a half years after operation. The second case, with the tumor weighing seven and a half pounds and the patient weighing 15 pounds, had "grown to fine healthy womanhood and had already survived eighteen years with every prospect of continued health and vigor." It has subsequently been learned from one of the nurses who cared for Dr. Abbe shortly before he died that this remarkable patient later was married and had a child of her own and was still in good health as late as 1924.[53]

It would not be possible to review in any detail all of the many different surgical conditions about which Dr. Abbe wrote. There are perhaps one or two subjects that he was interested in which deserve additional comment. One of these is the ingenious method he devised of dealing with esophageal strictures following a burn of the esophagus from swallowed caustics or acids.[54-57]

In 1892 such a patient in whom it was not possible to pass a dilator down through the mouth, came under Dr. Abbe's care at St. Luke's Hospital, and on December 9th of that year he operated on the patient, performed an esophagotomy in the neck and tried to pass a bougie down through the stricture in the lower esophagus via this opening but unsuccessfully. He therefore proceeded to make a simple gastrostomy and, inserting his finger up through the stomach into the orifice of the esophagus in the cardiac end, he was able to guide a very small filiform bougie, to which he attached a piece of heavy braided silk, up past the stricture out through the opening in the neck. With the string as a guide he attempted to pass a next larger size bougie up through the stomach and esophagus from below but could not do so until by exerting pressure on the bougie and sawing with the string the bougie suddenly passed quite easily. He was able to pass three larger sized bougies in the same manner until the stricture was cut and dilated to almost the normal size of the esophagus. "Bleeding was practically insignificant." "Uninterrupted recovery ensued." After a week the same method of dilatation was repeated. After this it was possible to pass bougies from the mouth to the stomach without difficulty. The string was removed. The wound in the neck closed spontaneously. "The patient was allowed to eat everything." She had no difficulty in swallowing raw oysters, meat, vegetables as naturally as ever for the first time in four years. She gained four and a half pounds a week. Eight weeks postoperatively the gas-

trostomy opening was dissected out, inverted and closed.

A follow-up on this patient 15 years later was given in a subsequent paper.[58, 59] "Post-operatively the largest bougie was passed down the patient's esophagus, at first every few days, then once a week, and monthly during the latter half year. Since then once a year I have tested the esophagus and there has never been the least recurrence of stricture."

Later, for another patient treated by this method whose stricture started to re-form, Dr. Abbe "devised a dilating metal guide which carried a string down to the face of the stricture and back again, so that working entirely from the patient's mouth the stricture could be worn through on the same principle."

Special mention should be made of Dr. Abbe's contributions to the surgery of the other end of the gastrointestinal tract. In 1902 Dr. Abbe presented a paper to the American Surgical Association on "The abdominal route for approaching rectal tumors."[60] In this he pointed out the advantage of the abdominal or combined abdomino-perineal approach for lesions lying high in the rectum near, at, or above, the peritoneal cul-de-sac.

Dr. Abbe wrote the section on surgery of the rectum and anus in Keen's Surgery.[61] It is a chapter well worth reading, written by an obvious authority, and well illustrated with many excellent drawings and photographs. It covers the subject thoroughly from the most common lesions to the various types of curative and palliative resections for malignant tumors.

Time does not permit a discussion of Dr. Abbe's work in the field of vascular surgery but he wrote several papers on the subject. He tried to promote clotting in an aneurysm by inserting catgut and wire into it and passing an electric current through the wire.[62] He experimented in animals on a method for anastomosing arteries over a piece of glass tubing[63] and, later, adopted Matas' method of obliterating aneurysms by opening them and closing the mouth of the aneurysm from within the sac.[64, 65]

His contributions to the field of plastic surgery[66-79] have been well reviewed by Dr. Richard B. Stark.[80]

Probably Dr. Abbe's greatest interest lay in the treatment of neoplasms of all sorts.[81] For a time he was on the staff of the New York Cancer Hospital. He discussed the surgical treatment of tumors of the skin, lips, face, mouth, jaw, palate, tongue, breast, kidneys, gastro-

intestinal tract, abdominal wall, and extremities.

He had an extensive experience with carcinoma of the breast, having done several hundred operations for it.[82, 83] He felt that better results were to be expected with more extensive operations, advised wide excision of skin with removal of the pectoral muscles, the contents of the axilla, and of the supraclavicular nodes when extension seemed to be in that direction. He was one of the first to recognize the influence of the ovaries on breast carcinoma[84, 85] as originally pointed out by Beatson, and removed the ovaries in a number of patients with extensive metastatic carcinoma of the breast. He found that in a few, particularly in patients who were still menstruating, there was a remarkable regression of the disease, in some there seemed to be a transient arrest of the disease, and in many there was no effect whatsoever. He mentioned the effects of other endocrine glands on the growth of tumors.

Several of his papers stressed the role of tobacco in the production of cancer, particularly of the lips, mouth, tongue, and throat.[86-88]

It was from this great interest in malignant new growths that he became curious about radium and the effects of radioactive rays on tumor growth.[89-114]

After about 1897-1900 Dr. Abbe resigned most of his positions in the other hospitals of the city and concentrated on his work at St. Luke's Hospital.[115] By that time the hospital had moved from its original site on Fifth Avenue at 54th Street to its present location on Morningside Heights.

When he arrived at the hospital he was formally met at the front door by the surgical house staff who accompanied him on his rounds.[116] His rounds were devoted to teaching. On the days when Dr. Abbe was to operate there were often visitors, many of them prominent physicians and surgeons in the city, and others, visitors from abroad.[116] His cases were always done in the large amphitheater on the surgical floor of the hospital. He always scrubbed with Ivory Soap.[116] He was one of the first surgeons in New York to use rubber gloves[117] after their introduction into operating room technique and commented on their comfort, the feeling of security they gave the surgeon, and the protection they offered the hands from contamination and odors from abscesses and other lesions surgeons were prone to get their hands into. He usually wore glasses while operating.[116] They were soaked in alcohol for some hours before. After his scrub he would walk over to the basin of alcohol

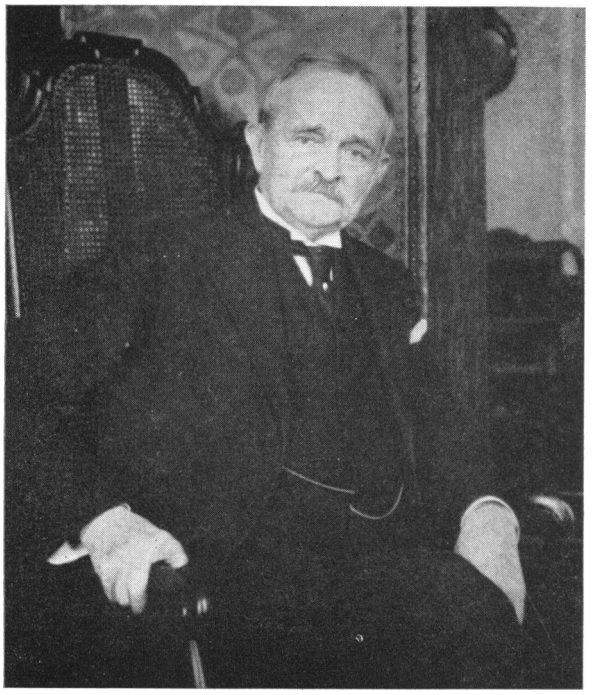

Fig. 5—Dr. Abbe in his later years. (Courtesy of Dr. and Mrs. Robert Abbe MacKenzie.)

in which the glasses were soaking, lift them out and put them on. At times during the operation he would readjust them without rescrubbing, to the consternation of some members of the staff.

During operations his manner was always one of outward calm and quiet.[118] He never raised his voice or became excited, even under the most trying circumstances. He seemed imperturbable. This atmosphere of calm pervaded the whole operating room staff. He always explained what he was doing to those around or to the visitors. He was dramatic, daring, and full of original ideas. He was deft and skillful in his work[119] and handled tissues with great gentleness. This was reflected in the generally excellent results he obtained.

The nurses at St. Luke's Hospital who still remember Dr. Abbe do so with the greatest admiration.[120] They remember him as a great gentleman. They remember the wonderful manner he had with patients, his insight and understanding. They remember him for his many kindnesses

to them. Every spring, for the graduation exercises in the training school, Dr. Abbe would send up as many American Beauty roses as there were nurses graduating. After his death Dr. Abbe left a fund of $10,000 to be used for the care of sick and needy nurses at St. Luke's Hospital.[121]

Evidently a facile speaker, Dr. Abbe belonged to many local, national, and international organizations. He was a member of the New York Clinical Society, the Practitioners Society, the New York Medical and Surgical Society, and the Charaka Club. He was an active member of The New York Academy of Medicine, where he gave a number of lectures and papers, and from 1906 to 1908 served as Vice-President.[122] There were innumerable meetings of the New York Surgical Society at which he presented cases, read papers, took part in the discussions or showed some interesting specimens, particularly during the years 1894 and 1895 when he was its President. He belonged to the College of Physicians of Philadelphia where he established the custodianship of the Rush, Jenner, Lister, Pasteur and Curie mementoes.[123, 124] He was a Fellow of the American Medical Association and the American College of Surgeons, and a member of the American Physicians and Surgeons Society, the American Surgical Society, the International Surgical Society and the Pathological Society. In addition to these professional organizations he belonged to the University Club and the Century Association.

About 1882, when the telephone was first beginning to be used in the city, he was one of the first doctors to have one installed in his office. It caused considerable comment and many inquiries from his friends.[125] Associated with him for about ten years, between 1890 and 1900, was Dr. Arthur Fisk whom Dr. Abbe referred to as his partner and with whom he shared his office.[126]

Dr. Abbe's office and instrument nurse for many years was Miss May Moon, a pleasant, efficient little English woman who devoted much of her life to Dr. Abbe's work.[127] It was still customary in those days for some operations to be done in the patient's home and on such occasions Miss Moon accompanied Dr. Abbe and set up, and helped him with, the operation.[126]

During the summer months Dr. and Mrs. Abbe often went to Bar Harbor, Maine. Here Dr. Abbe enjoyed himself in climbing the mountains, studying nature, taking photographs in both black and white

and in color, and painting water-colors. He bought a place in Bar Harbor called "Brook End," "where Duck Brook meets the Bay."[128] Having become an admirer of the Japanese and their art, following a trip to the west coast and Japan, he constructed a Japanese garden in this Maine setting with a small pond on which could be seen two swans, Pierre and Marie, named after his friends the Curies.

After Mrs. Abbe died he continued to spend much of his time in Maine. He made several beautiful papier maché relief maps of the Maine coast[129] in the vicinity of Bar Harbor and Mt. Desert. These were constructed of wet blotting paper and painted in shaded colors, using greens for the land and mountains, and blues for the sea. They were extremely detailed and accurate. In 1922 he noted[128] some Indian implements in a shop window in Bar Harbor and from this he began a new interest in the study of the Indian relics of the Red Paint people who once lived in this part of the Maine coast. He became a collector and an authority on the subject. He then conceived of establishing a museum for his maps and collections. He wrote others who had made collections of these Indian implements and asked if they would give them to the museum. One man, of whom he had made[130] such a request, refused to send his collection unless the building was fireproof. Dr. Abbe assured him that it would be and designed the building himself. The museum, now known as the Abbe Museum, is situated in the Glen of Sieur de Mont Spring in Acadia (formerly Lafayette) National Park in the northern part of Mt. Desert. In the great forest fire at Bar Harbor in 1946 the museum was in the path of the flames and it is a tribute to Dr. Abbe that it and all its contents survived unscathed.

During most of his early life Dr. Abbe enjoyed reasonably good health. In 1912, noticing a progressive enlargement of his head, he[131] suspected that he might have Paget's disease and this was subsequently confirmed with x-rays of his skull. In his later years, after the age of 60, he suffered from rather frequent attacks of anginal pain, dyspnea, and palpitations, but it was not until February 1924[132] that he was found to have a severe aplastic anemia probably resulting from his earlier exposure to radium rays. His hemoglobin at that time was only 35 per cent. With some reluctance he consented to have a transfusion and his anginal pain was greatly relieved. Thereafter he was given transfusions of 1000 cc. about every three weeks. These were given by Dr. Lester Unger,[133] of this city. His hemoglobin was kept around 60 to 65 per

cent. In July 1925, because of a severe attack of acute cystitis, he underwent a suprapubic cystotomy. He was kept alive with transfusions for a period of four years, receiving over 60 or 70 of them. During this time he was able to complete much of the work he was doing in building and setting up the museum at Bar Harbor. Shortly before it was opened to the public he died, on March 7, 1928, at the end of his 76th year.

At the dedication ceremonies of the Abbe Museum a few months later Bishop Lawrence quoted the following excerpt from one of Dr. Abbe's letters.[115, 130] "Conquest only comes from persistent climbing upward. Often it seems like the excitement I have felt when climbing Sargent or Green Mountain, or Fujiyama in Japan, the nearer one gets to the top the harder it seems – then all of a sudden one gets there. That glorious experience I have had many, many times in every field of adventure, in surgery, science, or climbing, and I like the game."

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